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Abstract

On the determination of the diffusion constants of H_2O and D_2O by neutron single-scattering experiments.

by

T. Springer, S. Kornbichler and H.D. Lemmel

Institut für Neutronenphysik der Kernforschungsanlage Jülich
and Labor für Technische Physik der Technischen Hochschule München

Normally the average thermal diffusion constant $\langle Dv \rangle$ is determined by integral methods, namely by investigating the relaxation of the neutron density in time or in space. In this work a different approach has been used by measuring the differential scattering crossection $d\sigma(\theta)/d\Omega$ for different neutron energies E and sample temperatures T. From the functions $d\sigma/d\Omega$ the diffusion constant D (E, T) and $\langle Dv \rangle$ can be calculated. It has been found that the scattering cross sections $d\sigma/d\Omega$ are very insensitive to the temperature. Therefore, the quantity $\langle Dv \rangle$ can be calculated within a large temperature range by means of a comperatively small number of $d\sigma/d\Omega$ measurements. Good agreement between these $\langle Dv \rangle$-data and the more conventional experiments has been observed for H_2O and D_2O.

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Abstract

A METHOD FOR SOLVING THE SPACE-ENERGY DEPENDENT NEUTRON TRANSPORT EQUATION

B. Montagnini and V. Pierpaoli
S.N.A.M. Divisione Agip Nucleare, S. Donato Milanese (Milano), Italia

A general theory for solving the space-energy dependent transport equation is developed. The method can be summarized as follows: the phase density of neutrons is expanded into a set of eigen-functions, relative to a one-velocity transport problem which contains the energy as a parameter. The Boltzmann equation is thus transformed into a set of integral equations whose unknowns are dependent on energy alone. These equations can be solved by means of a perturbation technique.

Some attention is paid to one-velocity calculation methods which make possible a good accuracy without demanding a great computational effort (such requisites are indispensable if space-energy dependent problems are to be considered).

An application to the evaluation of the resonance escape probability in heterogeneous systems is illustrated.